Seven Affiliated Colleges of the

University of Dhaka

Syllabus for the 3rd year B.Sc Honours Program

Subject: Zoology

3rd Year effective from the Session: 2019-2020

(First Year Session Started on Session 2017-2018)
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TOTAL 32 800
Animal Ecology

Introduction: Definitions, History and scope of ecology; Theoretical and practical approaches in ecology. Branches of ecology.

Abiotic Factors: Temperature, humidity, rainfall, pH, water, atmospheric gases and sunlight.

Biotic Factors: Microbes, plants, animals and their role in ecosystem.


Aquatic Ecosystems: Lentic and lotic ecosystems; Freshwater, brackishwater and marine ecosystems.

Terrestrial Ecosystems: Terrestrial ecosystems and its role in animal biota distribution.

Population Ecology: Introduction to population, population growth, population regulation. Positive and negative interactions in proto cooperation, commensalism, mutualism, competition, predation and parasitism

Population study methods: Mark and recapture methods (in fish); Quadrat and transect methods.

Community Ecology: Definition and types of communities; Community concept and analysis; Community structure, composition and stratification; Ecological niche and habitats. Biome and its types; Ecological successions and concept of climax; Ecotone.

Habitat Analysis: Diversity indices through Species richness (S), Simpson's index (D), Shannon-Wiener index (H) and Evenness (E) for interpreting the abundance and evenness of the species.

Animal Behaviour

Introduction: Definitions, History and scope of animal behavioural sciences, types of behaviour

Development of Behaviour: Stimuli, Experience, Environmental Drivers and Migration

Biological basis of Behaviour: Neural control of behaviour; Reflexes and behaviour; Effects of hormones on sexual, aggressive and maternal behaviour.

Instinct and Learning: Introduction to instinct and learning behaviour;

Imprinting and Learning: Sensitive period

Social Behavior in Animals: Altruism: Kin selection, mutualism, reciprocity, Parental care; Social behavior of honeybee, Three-Spined Stickleback and Non-human primate.

Signals for Communication and Non-Human Primate Ethnography: Types and functions of communication;

Animal Calls and their Behavioural Functions: Group organization, Peck order, Dominance hierarchy, Alpha male, Alpha female, Foraging, Browsing, Hording, Resting and Alloparenting.

Books recommended


ACZ 302  Evolution, Paleontology and Zoogeography  4 Credits  100 Marks

Evolution

**Quests of Organic Evolution:** Biogeography, comparative anatomy, physiology, embryology, palaeontological and genetical evidences. Convergent, divergent and parallel evolution.

**Trends in Evolutionary Thoughts:** Lamarckism, Darwinism, Wallace’s theory, Synthetic theory and modern views of evolution; Punctuated equilibrium.

**Speciation:** Definition, sympatric and allopatric speciation including induced speciation.

**Rates and Mechanism of Evolution:** Isolation, continuous and discontinuous variations, gene mutation and chromosomal aberrations.

Palaeontology

Introduction to palaeontology.

**Ancient life:** Fossil, Significance of fossils (*Trilobites*, *Dinosaurs*, *Archaeopteryx*), Types of fossils, process of fossilization, fossil dating methods. Living fossils (Lung fishes, Horseshoe crab)

**Geological Time Scale:** Major palaeontological events in geological time scale.

**Evolution of vertebrates:** Palaeontological evidences for the emergence of first vertebrates, horse, camel, elephants and human race.

Zoogeography

Introduction to zoogeography. History of the distribution of the land and water bodies of the world, Laurasia and Gondowana land, continental drift theory, land bridges.

**Animal distributions in the present world:** Zoogeographical regions and sub-regions of the world, their boundaries, physical characteristics, climatic conditions, vegetation and fauna. Patterns and general characteristics of fauna of tropical and sub-tropical regions.

**Pleistocene or Quaternary Glaciation:** Glaciation, interglacial period and its influence in the distribution of animals. Insular fauna.

Books recommended


Human Physiology

Digestion of food: Definition of food, nutrition and digestion; Salivary glands, composition and functions of saliva; Physiology of digestion. Absorption of carbohydrates, proteins and lipids; Role of liver and pancreas in digestion.

Enzyme: Classification, general properties, factors affecting enzyme action

Metabolism: Definition, metabolic pathways, metabolism of carbohydrates (Glycolysis, Kreb's cycle, electron transport chain), metabolism of glycogen in liver and muscles (Glycogenesis and Glycogenolysis), metabolism of lipids (deposited fats and its functions oxidation of fats), metabolism of proteins (fate and functions of amino acids, ornithine cycle, transamination-transmethylation). Role of endocrine glands, vitamins, phospholipids, steroids and cholesterol in body metabolism.

Circulation: Composition and function of blood, cardiac cycle, myogenic regulation of heart beat and transmission of impulse, blood circulation (Systemic, pulmonary and coronary), coagulation of blood, blood pressure, function of tissue fluids and lymphs.

Respiration: Pulmonary ventilation mechanism of breathing, mechanism of gaseous exchange and transport of oxygen and carbon dioxide in blood, respiratory pigments.

Excretion: Definition, types of waste products, physiology of excretion and urine formation, composition of urine, osmoregulation, regulation of blood pH.

Muscle contraction: Mechanism of muscle contraction and relation, neuromuscular junction, muscle twitch, rigor mortis, muscular fatigue.

Coordination (neural and hormonal): Neuron, mechanism of conduction of nerve impulse along axons, synapse, conduction of nerve impulse across synapse, neurotransmitter substances, reflex action, hormones and hormonal control.

Homeostasis: Definition, role of various physiological systems in homeostasis, feedback mechanism, dry mouth, dehydrations, electrolyte and homeostatic imbalance.

Healthy Lifestyle

Good living and exercise: Good health and Benefit of exercise; Physiology of running and swimming, Blood sugar level and its control, Body Mass Index (BMI), Basal Metabolic Rate (BMR). Strengthening, stretching, balance, and aerobic exercises, Yoga.

Food contamination: Contaminated foods, health concerns and related diseases.

Books recommended


**ACZ 304**  
Cell Biology, Molecular Biology and Introductory Immunology  
4 Credits  
100 Marks

### Cell Biology
History of cell. Prokaryotic and Eukaryotic cells, Cell theory  
**Cell:** General organization and ultrastructure of animal cell, Structure and Functions of cell membrane with membrane transport principles;  
**Cellular organelles:** Endoplasmic reticulum, Golgi body, Ribosomes, Lysosomes, Mitochondria, Centrioles, Peroxisome, Microtubules and Nucleus (Nuclear envelope, nucleosomes, chromatin fibre and nucleolus); Nucleo-cytoplasmic inter relationship.  
**Chromosomes:** Chromatin & Chromosomes, their structure, types and functions; giant chromosomes, heterochromatin and euchromatin  
**Cell division:** Mitosis and Meiosis, growth cycle, division and differentiation, significance.  
**Cell cycle:** Cell cycle stages and its regulation.

### Molecular Biology
**Nucleic Acids:** Structure and types  
**RNA:** RNA Structure and Composition of RNA, RNA processing, Mechanism of RNA splicing.  
**DNA:** Isolation of DNA from natural sources; Watson Crick Model and it’s characteristics, Replication, Transcription.  
**Genetic Codes:** Characteristics of Genetic Code and Wobble hypothesis, Concept of Central dogma, Gene, Genome, Genomics, Operon.  
**Protein Synthesis:** Protein synthesis mechanisms its regulation, Transcription, Translation, Post-translational modification (PTM) of released protein.  
**Gene regulation:** Gene expression, regulation and control, Control at hormonal level.  
**Techniques of Molecular Biology:** DNA Sequencing, Blotting, and Enzyme Linked Immunoserbent Assay (ELISA); Polymerase Chain reaction (PCR), Electrophoresis.

### Introductory Immunology

### Books recommended
ACZ 305  Genetics

4 Credits  100 Marks

Introduction to Genetics: A short life sketch of Mendel, Common technologies used in genetics.

Mendel laws of Inheritance: Laws of inheritance, deviations from mono-hybrid and di-hybrid cross ratios, Incomplete dominance (e.g. Australian fowl), Co-dominance (e.g. Roan Cattle)

Multiple alleles: Blood groups in human, pseudo-alleles, Rh factors, blue-baby syndrome, polygenic inheritance (e.g. Skin colors and height in humans).

Linkage and Crossing over: Theories, types and significance.

Sex Linked Inheritance: Characteristics of XY and ZW sex chromosomes; Sex determination, XY and ZW linked gene inheritance; sex linked inheritance in Drosophila, birds and men; sex limited and sex influenced traits.

Chromosomal variations: Chromosomal aberration, euploidy, monoploidy, polyploidy, nullisomy, trisomy, double trisomy, tetrasomy and chromosomal abnormalities in man.

Mutation: Chromosomal mutation (deletion, duplication, inversion, translocation, aneuploidy), gene mutation (induced and spontaneous mutation), Detection of mutation by CIB and muller-5 methods. Reversion, Pleiotropism, Penetrance and Expressivity

Human Genetics: Pedigree analysis, human traits, sex linked diseases, disorder due to mutual genes, eugenics and euphenics.


Animal Breeding: Types of breeding and their effects, Practical application of inbreeding, out breeding and cross breeding in farm animals. Hybridization.

Books recommended
Developmental Biology
History and theories of developmental biology (epigenesis, pangenesis and germplasm).
**Reproductive process in animals**: Asexual, sexual and parthenogenesis, reproductive peculiarities; monogamy and polygamy.
**Gametes and gametogenesis**: Ultra-structure of a typical sperm; spermatogenesis in mammals; ultra-structure of an egg; types of eggs; oogenesis in mammals.
**Fertilization in animal world**: Types and significance of fertilization.
**Major events in fertilization**: sperm-egg interactions; fate of sperm mitochondria. Cleavage, cleavage patterns and types; formation of morula and blastula, gastrula, process of gastrulation and sequence of events; basic differences between protostomes and deuterostomes development.
**Organogenesis**: Fate of germ layers; Early embryology of Rag worms, Neanthes (=Nereis) and Red Jangle fowl (Gallus gallus); Embryonic development of Zebra fish (Danio rerio).
**Embryological derivatives**: Placentation, Placenta types and the functions in mammals.
**Applied embryology**: Introduction to Cryopreservation, Basic concepts of induced breeding of fish and animal cloning; Infertility and its treatments in human.
**Experimental embryology**: Use of experimental animals Caenorhabditis elegans, Drosophilla, and Danio rerio in embryological research. Ethical issues in experimental embryology. Production of Drosophilas for experimental purpose. Hybrids and transgenic animals.

Demography
Introduction, definition and history and perspectives of demographic development.

Family Planning
Human reproductive system and accessory glands. Sex hormones and their role in human reproduction, puberty, ovarian cycle, menopause.
Regulation menstrual cycle and pregnancy. Fertilization, pregnancy, placenta, fetus and development, parturition (child birth).
Importance of family planning and management, ethics of family planning. Birth control principles and methods.

Books recommended
Animal tissue techniques: Preparation of permanent histological slides from vertebrates organs.

Ecological assessment and habitat analysis: Study on pond ecosystem and their floral and faunal composition. Population study of a species on a given area by using mark-recapture/ quadrat/transect methods. Diversity indices [Species richness (S), Simpson's index (D), Shannon-Wiener index (H), Evenness (E) for interpreting the abundance and evenness of the species in nature].

Water quality analysis: Determination of dissolved oxygen, free carbon dioxide, ammonia, nitrite, pH, Total Dissolved Solids, Electrical Conductivity values from local waterbodies and interpretation of the results.

Cell Biology: Models /slides on cell divisions.


Molecular Biology: Study of polytene chromosome; Study of human genetic traits (ear lobe, eye color); Extraction and Quantification of DNA; Separation of DNA by Agarose gel electrophoresis, protein separation by PAGE; Preparation of family/class-based survey report on human genetic traits. Chromatographic separation of cellular materials. Cell divisions (mitosis/meiosis).


Study tour to the forest/sea/estuary ecosystem: The study tour will expose students to the forest, coastal/marine and island ecosystem to understand the ecological footprint, heritage, culture, wilderness, economy and biota within. From transect-walks in forest to faunal collection at the coastal/marine waters each student under this tour will be exposed to nature and discover the uniqueness of ecological services that exists in Bangladesh. Students will work with teachers, professional scientists, and become a part of the tour by observing and recording real life scenario. Each student has to generate a report on the travel-logs, unique wild and culture- fauna of Bangladesh.

Practical Notebooks and Reports: As per set-standards and instruction of the class teachers/ demonstrators.

Distribution of marks for Third Year Final Practical Examination

Animal tissue techniques = 20 marks
Block preparation– 4; tissue section– 4; tissue stretching– 3; tissue staining– 3; tissue identification– 2; drawing and labeling– 2; identifying characteristics-2.

Study of an Ecosystem and Report writing = 20 marks
Water Quality Analysis = 20 marks
One/two parameters will be given in the examination and the following points will be mentioned-Preparation and Objectives-4, Procedure-5, Data taking and presentation-5, Data analysis and interpretation – 6

Genetics & Molecular biology = 25 marks
Human Physiology & Exercise = 25 marks
Field Exposure visit and report = 20 marks
Field visit- 5, Expedition report-15( Reporting 10+ Synthesis 5; No visit carry 0 marks)
Practical Notebook –(10 marks) & Two Reports (on Ecology & Water quality-10 marks) = 20 marks
Cytology, Genetics, Physiology and molecular biology; Reports on Ecology and Water quality

Total = 150 marks

ACZ 310  Viva voce  2 Credits  50 Marks

The viva voce examination will be conducted by assigned teachers. It will provide verbal opportunities for students to demonstrate their skill developed in the field of zoological sciences.